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ABSTRACT

Two studies were made of the validity and reliability of a Learning Style Inventory (LSI) for postsecondary deaf individuals. The study's a priori definition of learning style was multidimensional and included aspects of field dependence/independence and perceived locus of Nineteen students were administered the LSI and immediately interviewed on an item-by-item basis. Two validation studies were then performed of the 36-item LSI. In study 1, 100 students were given the LSI and GEFT in a randomly counterbalanced sequence. Item and factor analyses were performed on the resulting data. The findings showed the LSI psychometric properties to be disappointing. A second validation study was carried out to test the hypotheses that the results of the first study were because (1) the dichotomous format of the original LSI limited the variance within each item: and (2) the subjects used were not appropriately experienced. In the second study using 204 students, the 36 LSI items were converted to 72 Likert items with 5 response alternatives. The validation criterion used was the Survey of Study Habits and Attitudes (SSHA) Form H. Results of the second study showed that 11 of 16 correlations between the LSI and SSHA subscales was significantly correlated with the GPA. The overriding finding of the study was the implication that paper and pencil self-report techniques for the assessment of personality variables has use with deaf individuals. (DLS)

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Validity and Reliability of a Learning Style Inventory for Postsecondary Deaf Individuals

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Background and Purpose

This study began as a part of a larger project whose purpose was to identify categories of captioned instructional films and videotapes which produced various instructional outcomes for deaf learners. In view of the visual aspect of this type of instructional situation, we hypothesized that field-dependence/independence cognitive style, as espoused by Dr. Witkin and his associates, was a significant moderator variable. Typically, individuals are categorized as either "relatively field-dependent" or "relatively field-independent" depending on how they perform on a test of figure-ground perceptual disembedding ability. A vast amount of research, much of it performed by Dr. Witkin, et. al., indicates that field-dependent and field-independent learners differ in many educationally-pertinent ways. Table 1 delineates the most salient of those apsects abstracted from the 1977 RER review by Dr. Witkin, et. al.

These characteristics have implications for career decision-making as well. For example, a relatively field sensitive individual would be better suited to work as a social worker, which requires interpersonal skills, than would a relatively field-independent person. A relatively field-independent individual, on the other hand, would be better off in a career which would exploit his or her natural analytical perspective, such as engineering or accounting. Thus we saw relative field dependence as pertinent to career decision-making, media research, and other instructional research for deaf learners.

Table 1

Characteristics of Field-Dependent and

Field-Independent Individuals

RELATIVELY FIELD-DEPENDENT INDIVIDUALS

- Respond to social cues.
- Require externally defined goals and reinforcements.
- Learn more readily when provided with visual models or examples.
- Are responsive to the dominant arrangement of the (perceptual) field as given.
- Learn more readily when an external plan (structure) is provided.
- Benefit from concrete examples.
- Benefit from frequent reinforcement.
- Learning performance improves gradually rather than in leaps.
- Learn more readily with an explicit organization of materials/content.
- Learning transfer is improved by guidance.
- Look at the whole rather than parts.
- Need explicit instruction in problem solving strategies.
- Need to establish a new set with each new focus.

RELATIVELY FIELD-INDEPENDENT INDIVIDUALS

- Tend to have self-defined goals and reinforcements.
- Learn more readily when allowed to impose their own structure on the field (external structure may interfere).
- Learn readily from verbal material.
- Learn readily under conditions of intrinsic motivation.
- Tend to be analytical—see things in terms of their component parts.
- Are able to handle large-step programs.
- May perform better when allowed to generate their own problem-solving strategies.
- Can distinguish relevant from irrelevant cues in concept attainment.
- Tend to use an hypothesis-testing approach rather than a spectator approach to concept attainment.

As the project became more crystallized we began to think more in terms of learning style, hypothesized that perceived locus of control would be a relevant aspect, and included that construct. Thus, this study's a priori definition of learning style was multidimensional and included aspects of field-dependence/independence and perceived locus of control.

Typically field dependence is measured by one of two methods. Individually administered tests, such as the CEFT and EFT, are generally considered to be more reliable and valid, however they are time consuming and hence expensive to administer, requiring 20 to 60 minutes per subject. More frequently, field-dependence is measured by a group-administered version which tests subjects' ability to identify a given geometric figure in a complex field (e.g., GEFT). With this measurement technique a low score is taken to indicate relative field-dependence. A problem for us is that low scores can result from a misunderstanding of instruction, lack of motivation, etc. We were sensitive to the variance in our students' abilities to comprehend written instructions and felt that a rating scale completed by the students was the most feasible measurement technique. This is the most typical device for measuring locus of control, and it has also been successfully employed to assess perceptual/learning styles, variously defined.

Method

Reviews of the literature on field-dependence/independence and locus of control yielded an initial set of items which tapped a wide variety of aspects of each construct. These original items were refined to the fourth grade reading level and instrumented into the first version, which consisted of 51 forced-choice items. The vocabulary and syntax level of these items was further refined and five were discarded. The resulting 56-item version was piloted with 19 NTID students randomly drawn from the lower 33% of the NTID distribution of prose reading ability (as measured by the paragraph completion

subtest of the CGPP). The students were administered the LSI and then interviewed on an item-by-item basis. This was done individually for each of the 19 subjects immediately after completion of the LSI. As a result, the LSI was further refined and reduced to 36 items. Two validation studies were then performed.

Validation Study 1

Subjects. One-hundred NTID SVP79 students volunteered and were paid to participate. This comprised one third of NTID's SVP population for 1979.

Criterion. The GEFT was employed as the validation criterion. Witkin et al (1971) report a reliability estimate of .82 (section 1 - section 2 correlation), and validity coefficients ranging from |.34| to |.82|.

Procedure. The LSI and the GEFT were administered to subjects in randomly counterbalanced sequence. Groups of three or fewer were run so as to allow for individual instruction regarding directions, particularly for the GEFT.

Analyses and Results. The LSI item responses were coded one or two, with a two in the direction of field independence and internal locus of control. Numerous item and factor analyses were performed on this data base. Simple and complex correlations among the LSI and the GEFT scores were also performed. In short, the psychometric properties of the LSI were disappointing. The factor structures were not acceptably interpretable, reliabilities of subscores were never above .60 (aside from interpretation difficulties) and there was essentially no evidence for validity. An examination of the inter-item correlation matrix indicated that, of the 630 unique correlations, only 49 (.078) exceeded the .05 level of significance.

Conclusions and Implications. After numerous discussions with teachers, researchers and others at NTID, we attributed the poor psychometric performance of the LSI to one or both of the following:

- The dichotomous format of the original LSI limited the variance within each item (items could only be scored a or b), and hence attenuated the magnitude of inter-item correlations.
- SVP students were not an appropriate group to use the instrument. Several instructors and counselors hypothesized that although incoming NTID students do indeed have a method or "style" they use to study, they have not had enough experience within the environment, or the opportunity to make study decisions in their previous environment, to be able to respond to some of the items. Hence, the instrument might be appropriate for use with more experienced students (see Garcia and Whigham, 1958).

The purpose of study two was to test each of these hypotheses.

Validation Study 2

Subjects. Two-hundred and four NTID students who had been at NTID for at least two quarters were paid to participate.

Measures. The 36 LSI items were converted to 72 Likert items with five response alternatives. The validation criterion employed was the Survey of Study Habits and Attitudes (SSHA, Form H). Impressive statistics, including an interform correlation of .98, and correlations with GPA around .50, have been reported for this instrument (Brown and Holtzman, 1955). The SSHA was slightly modified, simplifying the syntax and vocabulary.

Procedure. Subjects were run in groups of three or fewer. Instructions were individually explained, and approximately one-half of the subjects completed the LSI before the SSHA.

Analyses and Results. The LSI responses were coded 1-5 (SA to SD) and factor-analyzed using the technique of principle factor analysis with varimax rotations. Four factors with acceptable interpretability emerged:

1) Locus of Control, positive events;

2) Locus of Control, negative events;

3) Field Independence, academic/career; and

4) Field Independence, personal/social.

Factor scale scores were derived from the factor-analysis results, with the number of rating items for each ranging from 4 to 12. For each of these subscales, an individual's score consisted of the sum of the appropriate response codes. Table 2 shows examples of items from each of these LSI subscales, as well as examples from the SSHA subscores. The SSHA subscores each included 25 items as indicated by the SSHA Manual (Brown and Holtzman, 1967).

Table 3 shows the simple correlations among the SSHA and LSI subscores, and GPA. The reliabilities, also shown, range from .66 to .80 for the SSHA, and from .61 to .78 for the LSI.

Significant correlations ($p < .01$) are observed between GPA and three of the four SSHA subscales. This is consistent with results reported by Brown and Holtzman (1967). All told, the SSHA reliabilities, interscale correlations, and relationships with GPA are consistent with results from studies which employed hearing counterparts.

Eleven of the 16 correlations between the LSI and SSHA subscales are significant ($p < .05$) and range from .15 to .47. The median of these correlations is .238 ($p < .01$). The locus of control, negative events subscale was not correlated with any of the SSHA subscales, and none of the LSI subscales was significantly correlated with GPA (all ps $< .05$).

Table 2

Examples of Items from Each of the LSI and SSHA Subscores

LSI	Locus of Control, Positive Events:	
		1. To get more money at work, a person has to be lucky.
		2. When I get a good grade in a course, it is most often because the teacher liked me.
	Locus of Control, Negative Events:	
		1. If I fail a course, it means that my work was not good enough.
		2. When I have trouble learning something in a class, it is most often because I did not try hard enough to learn it.
	Field Independence, Academic/Career:	
		1. If I have to work on (solve) a new problem in math or science class, I like to try to do the problem myself.
		2. I know what I want to do for my career.
	Field Independence, Personal/Social:	
		1. I learn better when I study with my friends than when I study by myself.
		2. When I am going to see a movie, and the movie has the same story as a book, I like best to read the book first, then see the movie.
SSHA	Delay Avoidance:	
		1. When my homework is very long or my homework is very hard, I sometimes quit or only finish the easy parts.
		2. When I am absent (not in class), I do the work I missed without being told to by the teacher.
	Work Methods:	
		1. When I write reports, I make sure that I understand what the teacher wants before I begin to write the reports.
		2. I get nervous and confused when I take tests and make mistakes even if I know the answers.
	Teacher Approval:	
		1. Teachers try to boss students too much.
		2. Teachers give better grades to students they like.
	Educational Acceptance:	
		1. If I do not like a class, I still work hard to make a good grade.
		2. I lose interest in my studies after the first few days of school.

Table 3

Intercorrelations[a] Among the SSHA and LSI Subscores and GPA (N = 196)

	DA	WM	TA	EA	LC+	LC-	FDAC	FDPS	GPA
1. Delay Avoidance (DA)	[.74]								
2. Work Methods (WM)	.64**	[.77]							
3. Teacher Approval (TA)	.43**	.53**	[.80]						
4. Educational Acceptance (EA)	.64**	.61**	.66**	[.66]					
5. Locus of Control, + (LC+)	.20**	.47**	.41**	.37**	[.78]				
6. Locus of Control, - (LC-)	.10	.09	.13	.10	.16*	[.68]			
7. Field Dependence, Acad./Career (FDAC)	.28**	.15*	.02	.15*	-.14*	.07	[.69]		
8. Field Dependence, Pers./Soc. (FDPS)	.20**	.39**	.16*	.24**	.23**	.13	.13	[.61]	
9. GPA	.31**	.19**	.11	.28**	.04	.08	.13	.11	[na][b]

[a]Diagonal (boxed) entries are Hoyt estimates of reliability (internal consistency).

[b]Not available.

* $p < .05$.
**$p < .01$ (two-tailed tests).

Discussion and Implications

The consistency of the psychometric characteristics of the SSHA subscales in the present study with previous results from hearing counterparts indicates its usefulness for hearing impaired students.

The factor structure of the LSI resulting from the second study was more interpretable than that of the first study. In addition, the reliability of the resulting subscales was higher, with the lowest from this second study (.60) being equal to or greater than the highest of the first attempts. In addition, the observance of positive and negative locus of control subscales is consistent with the Intellectual Achievement Responsibility (IAR) scale of Crandall, Katkovsky, and Crandall (1965). While these results speak favorably for the revised LSI, we cannot determine whether the Likert response format or the increased academic experience of the subjects was responsible. Both of these aspects were changed simultaneously in order to maximize the outcomes of study 2. The lack of significant correlations between the LSI subscales and GPA was not expected. A plausible explanation is that other variables moderated possible relationships between locus of control and GPA. Various and uncontrolled types of instruction received could have produced such an outcome. This is consistent with an aptitude by treatment interaction (ATI) perspective wherein latent disordinal interactions may be present. A recent study reported by Parent, Forward, Canter, and Mohling (1975) reported such an ATI between locus of control and teaching strategy. While internals learning performance was optimized by a low discipline strategy, externals performed better under high teacher discipline conditions. Had these investigators not controlled for instructional technique locus of control would have been unrelated to learning performance. In the present study GPA was based on learning performances produced by randomly different and uncontrolled instructional techniques.

An overriding finding of the present study is that paper and pencil self-report techniques produced psychometrically sound measures of personality variables. While this has been amply shown with hearing subjects, we are unaware of other such studies with the hearing-impaired. This implies that paper and pencil self-report techniques for the assessment of personality variables has utility for deaf individuals.

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